Center Independent Research & Development: JPL IRAD

Technology for Icy Moons Seismology

Completed Technology Project (2016 - 2018)

Project Introduction

Development of ultra sensitive micro and macro Very Broad Band seismometers for the Moon and Ocean Worlds.

Define the system architecture under which Icy Moon seismometers will need to operate.; Select a seismometer technology for advancement. Identify state-of the art Very Broadband and Micro Electro-Mechanical System (MEMS) sensor technologies potentially applicable for the Icy Moons environment, and rank them based on their potential to fulfill the observational requirements determined by our sister Science task (101), and to comply with the system architecture. Develop selected technology.

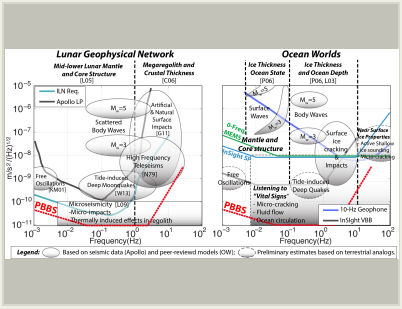
Anticipated Benefits

Incoprorates lessons learned from the InSight mission.

In the coming years and decades NASA may launch a series of missions to explore Ocean Worlds of Jupiter and Saturn in search of life, or conditions for life, in the outer Solar System. Seismology is key tool for determining both the deep and shallow interior structure and material properties of planetary interiors - necessary for determining their thermal and chemical structure and thus their habitability. Moreover, in addition to ice-quakes and deep moonquakes, seismometers can listen to the moons' distinct "vital signs" by detecting fluid motion in the shallow subsurface, seismic signals emanating from cryo-volcanos, and conceivably sub-glacial ocean circulation. In addition to Ocean Worlds, the Lunar Geophysical Network is identified in the Planetary Science Decadal Survey as one of seven New Frontiers mission concepts. Planetary seismometers are therefore both mission enabling and mission enhancing technologies that will play a key role in future planetary exploration.

Potential benefit to Broad Band exploration geophysics.

Small, sensitive, and cost effective seismoeters hold potential benefits for DoD, DoE, and the USGS.



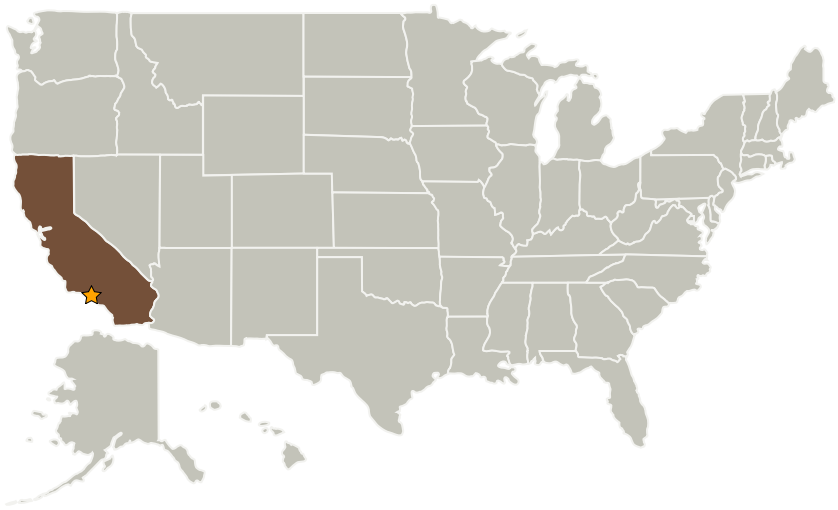
Preliminary seismometer sensitivity requirements were developed based on Lunar data, Models, and Terrestrial analogues.

Table of Contents

Technology for Icy Moons Seismology

Completed Technology Project (2016 - 2018)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Center Independent Research & Development: JPL IRAD

Project Management

Program Manager:

Fred Y Hadaegh

Project Manager:

Fred Y Hadaegh

Principal Investigator:

Sharon Kedar

Co-Investigators:

Julie C Castillo
Talso C Chui
Steven D Vance
Karl Y Yee

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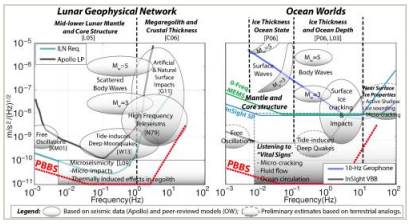
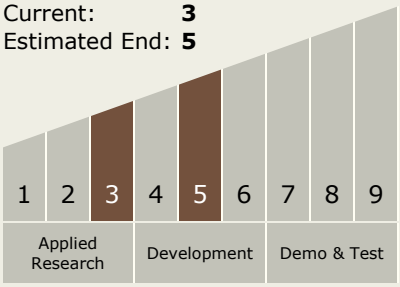
Images



Preliminary Science Requirements and Projected Instrument Performance
Preliminary seismometer sensitivity requirements were developed based on Lunar data, Models, and Terrestrial analogues. *(https://techport.nasa.gov/image/26034)*

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **5**



Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.2 Mobility
    - TX04.2.1 Below-Surface Mobility

Target Destinations

Others Inside the Solar System, Foundational Knowledge

Supported Mission Type

Push